

Automotive Engineering International Presents

SHOW DAILY



AUTonomy reveal caps fuel-cell discussions

Three days of fuel-cell discussions wrap up today with a Fuel Cell Power for Transportation panel beginning at 9:00 a.m. in room M2-29, which will address both in-progress and about-to-begin field trials. The SAE 2002 fuel-cell sessions are co-sponsored by the American Ceramic Society (ACS) and follow an SAE co-sponsored symposium within the Engineering Ceramics Division meeting of the ACS in January that emphasized materials for reformer catalysts, sensors, and oxide-based fuel cells.

During today's panel, several field trials will be on the agenda, with the California Fuel Cell Partnership's being one of the most prominent. Panelists from **Ford Motor Co.**, **BP International, Inc.**, and **General Motors** are scheduled to discuss the value of field trials, the results to date, and testing requirements before fuel-cell technology is considered viable for production.

During Monday's all-day Fuel Cell Power for Transportation technical session, representatives from companies such as **Hyundai Motor Co.**, **Toyota Motor Corp.**, **PSA Peugeot Citroën**, **Millennium Cell**, **FEV Motorentechnik GmbH**,



The AUTonomy's control and propulsion systems are contained within a 150 mm (6 in) thick "skateboard" chassis on which any number of vehicle bodies can be mounted.

Continued on page 3

No answers to CAFE conundrum from Congress panel

Yesterday afternoon's panel on possible alternatives to federal Corporate Average Fuel Economy (CAFE) standards didn't set out to resolve the multiple dilemmas any alternative would entail—and delivered on that promise.

For every set of advantages a speaker listed in his Powerpoint presentation, another speaker (and in some cases even the speaker himself) offered a list of disadvantages. CAFE being a politically explosive issue, the moderator of the session asked attendees that none of the speakers be quoted. The panel consisted of two

representatives each from the OEM and environmental communities, plus a researcher.

It was the strong opinion of one speaker that it's unlikely the government will opt out of its prerogative to set fuel-economy standards. The speaker noted that the National Resource Council (NRS) report on CAFE issued last year characterized as appropriate

the government's hand in controlling fuel economy in some way. That same report also acknowledged that there might be better ways than CAFE to do

Continued on page 3



One of the more popular display vehicles at SAE 2002 was Harley Davidson's V-Rod. It is featured in the displays of Schenck Pegasus (Booth 2001) and Dyne Systems (Booth 114), who provided dynamometer services and equipment, and Emitec (Booth 1401), which contributed catalyst technology. Announced in July, the V-Rod is the first member of a new family of performance custom motorcycles. The anodized aluminum bike features a Revolution engine combining liquid-cooling, 60° geometry, and dual overhead cams. Inspired by the VR 1000 Superbike race program and developed by Harley-Davidson's Powertrain Engineering team, the Revolution spins its one-piece forged crankshaft with side-by-side rods featuring full-pressure bearing journals. Displacing 1130 cm³, the Revolution produces an impressive 115 hp (86 kW) at 8250 rpm.

SAE, VDI sign MOU

VDI (Verein Deutscher Ingenieure—the German Association of Engineers) and SAE (the Society of Automotive Engineers) International announced on Tuesday that they have signed a cooperative agreement aimed at expanding the technical and scientific cooperation between two of the world's top engineering societies. Senior officials of both societies were present at the press conference announcing the signing and outlined global advance technology meetings they plan to hold in support of the memorandum of understanding (MOU). In attendance were Professor Uwe Loos, Chairman of



Dr. S. M. Shahed, SAE 2002 President, and Professor Uwe Loos, Chairman of VDI Division for Automotive and Traffic Systems and Technology, with the signed MOU.

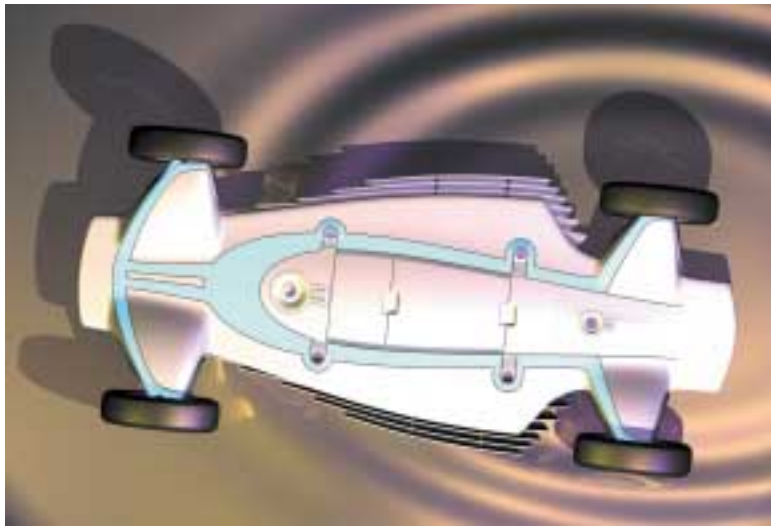
VDI Division for Automotive and Traffic Systems and Technology; Professor Ulrich Seiffert, Member of the VDI Council and an SAE Fellow; Carlos Strauss, Chief Executive, VDI Automotive Systems; Dr. S. M. Shahed and Neil Schilke, SAE's 2002 and 2001 Presidents; Karl Goering,

Continued on page 4

Today's Congress highlights

- Hybrid Electric Vehicles: Niche or Mass Market Executive Panel—Room O2-33, 9:00-11:00 a.m.
- India Business Panel—Room O2-35/36, 9:00 a.m.-12:00 p.m.
- 42V Panel—Room D2-9/10, 9:00 a.m.-12:00 p.m.
- Fuel Cell Panel (Part E)—Room M2-29, 9:00 a.m.-12:00 p.m.
- Six Sigma—Room D2-13/14, 8:00 a.m.-5:00 p.m.
- Mobility Technology Planning Forum V—Room D2-9/10, 2:00-5:00 p.m.
- Changing Trends in Automotive Casting—Room D3-24/25, 2:00-5:00 p.m.
- Spotlight on China Panel—Room O2-33, 4:30-6:30 p.m.
- Cliff Garrett Lecture: Challenges and Progress of Integrated Product Development for Turbine Engines—Room W2-67, 5:00-6:00 p.m.

AUTOmomy reveal caps ...continued from page 1



The main conduit for AUTOmomy's electrical system is a universal docking port at the center of the chassis that connects all of the body systems to the rolling chassis.

Horiba Ltd., and Motorola SPS addressed vehicle development as well as proton exchange membrane (PEM) fuel supply, storage, modeling, simulation, measurement, and control.

On Tuesday, PEM and solid oxide fuel cells were discussed, followed by a panel comparing the two technologies, with representatives from companies such as Toyota, **OMG's** DMC2 division, Ford, **Delphi** Automotive Systems, **Acumentrics** Corp., and **Arthur D. Little** Inc.

The highlight today will be a presentation by Mohsen Shabana of GM at 9:00 a.m. entitled GM AUTOmomy—Reinventing the Automobile. Plans call for the vehicle's "skateboard" chassis to be displayed at the event.

GM surprised North American International Auto Show attendees with the AUTOmomy fuel-cell concept, which the company said is intended to revolutionize the way vehicles are designed, built, and operated. The company is seeking 24 patents covering AUTOmomy-related business models, technologies, and manufacturing processes. The concept is the first designed from the ground up around a fuel-cell propulsion system and the first to combine fuel cells with x-by-wire technology for electronic control of steering, braking, and other vehicle systems. It runs on a fuel cell adapted from GM's HydroGen III system.

All of the AUTOmomy's control and propulsion systems—fuel-cell stack, hydrogen storage system, braking, steering, etc.—are contained within the 150 mm (6 in) thick skateboard chassis, so the vehicle body is freed from traditional design limitations. The skateboard allows a low center of gravity with good ground clearance, handling, and roll resistance—even with a tall vehicle body. GM partnered with **SKF** on the concept's x-by-wire technology, resulting in the development of a hand-operated guide called the X-drive, which replaces the traditional foot pedals, instrument panel, and steering column.

Fuel cells for automotive uses took on even greater importance recently when the Bush administration threw its support behind Freedom CAR (Consortium for Automotive Research), the U.S. Department of Energy and automotive industry's plan aimed at developing fuel cells for the automotive industry. The effort will surely be a topic of another SAE-related event in the Spring, when *Automotive Engineering International (AEI)* holds its second Fuel Cell Transportation Technology Summit. Scheduled for April 8 at the Ritz Carlton in Dearborn, MI, the industry's top executives and experts in the field will discuss, in an interactive format, the most recent developments with respect to this revolutionizing power source. In conjunction with the one-day summit kickoff of what has essentially turned into an SAE fuel-cell week will be a tour of Ford's hydrogen-fueling facility, meetings of SAE's fuel-cell standards committees, and an SAE Fuel Cell TOPTEC with tabletop exhibits. The planned roster of industry experts at the event include Dr. Ferdinand Panik of **DaimlerChrysler**, Rex Luzader of Millennium Cell, Paul Berlowitz of **ExxonMobil**, Tarou Hagiwara of **Nissan**, and William Smith of **Proton Energy Systems**. The summit will have a unique audience-driven format focusing on advances in fuel-cell technology, systems challenges, and fueling/infrastructure issues. For more information on the summit and other fuel-cell-week events, visit www.aei-online.org/automag/fcsummit.htm.

The SAE 2002 sessions and AEI summit are just part of a much larger fuel-cell initiative within the organization. The SAE website has a new Fuel Cell Technology Showcase portal (<http://fuelcells.sae.org>) that highlights all SAE products, services, and activities related to mobile fuel-cell technology. The site also contains some basic information about how fuel cells work and provides links to numerous books, standards, papers, technical sessions, and training that SAE provides to its automotive customers.

Kevin Jost

Marquee attendee

Of the hundreds of **Delphi** engineers to attend and/or participate in this week's SAE Congress, the company's director of engineering, Andrew Brown, was among the first to push through Cobo Center's doors Monday.

Brown, who in October will be inducted into the National Academy of Engineering, is also planning to turn off the lights as he leaves Cobo after the show closes. The long-time member and incoming Board Director for SAE likes to be where the automotive engineering action is.

"This is the focal point of the industry," Brown said about why he carved out an enormous block of time in his schedule to attend and participate in the SAE Congress this week. "As such, you want to be here."

"People come to learn things about new technologies, systems, and products that are being introduced, but also to keep abreast of new developments in very fundamental technologies," Brown added.

"There is this understanding that is gained as to what the customer is going to be requiring in

vehicles in terms of functionality and as to what can be enabled by new technologies and products."

Engineers at Delphi realize this, and of their own accord many hundreds will attend the Congress this week. A large portion of them will be presenting papers—26 in all by Delphi engineers. The others are free to choose which of the 1200-plus technical paper presentations to attend. Brown noted that engineers are given great freedom in the resources they use to come up with innovative technologies. Delphi engineers submitted 2417 invention disclosures in 2001, receiving 605 patents.

Brown is responsible for driving common practices across Delphi's 16,000-person engineering

community, which consists mostly of engineers but also technicians and scientists spread across 32 technical centers worldwide. He also chairs the Delphi Engineering Task Team, which is responsible for the company's \$1.8 billion budget for research, development, and engineering, and is in charge of implementing continuous improvement methods.

Patrick Ponticel



One of Brown's early Monday morning visits was to Automotive Engineering International at Booth 1000.

No answers to CAFE ...continued from page 1

so, including tax credits for buyers of vehicles that get good fuel economy, a fuel tax increase, and other measures.

The panel was in general agreement that, notwithstanding the advantages of a fuel tax increase, political considerations (*i.e.*, strong public opposition) eliminate that option.

As one of the speakers noted, an appropriate debate on the fuel-economy subject cannot take place without the players first agreeing on whether to base a system on the costs of obtaining fuel-economy improvements or on the specific amount of fuel-economy improvements desired. The current CAFE system, this speaker said, is based on the latter, but it is unresponsive to the market demand.

The current CAFE standards are 20.7 mpg for light trucks (pickups, SUVs, minivans) and 27.5 mpg for passenger cars.

Under a system used in Japan and proposed by some for the U.S., there could be different standards for each of several

weight classes. Also proposed was a system involving tradable fuel-economy credits.

Placing disincentives on total vehicle miles traveled is something that should be examined more closely, one speaker said.

Technologies identified in the NRC CAFE report to reduce fuel consumption include multi-valve overhead cam engines; variable valve intake and exhaust cam phasing; variable valve lift and timing; cylinder deactivation; supercharging and downsizing; variable compression ratio; intake valve throttling (continuously variable lift); camless valve actuation; five- and six-speed automatic transmissions; automatic transmission with aggressive shift logic; continuously variable transmission; advanced (high-torque) CVT; and integrated starter-generator with idle shutoff.

Patrick Ponticel

Editorial staff

Automotive Engineering International editorial staff for the Show Daily can be reached during show hours at Booth 1000 or by calling (313) 393-4324.

Kevin Jost,
Editor
kevin@sae.org

Frank Bokulich,
Associate Editor
bokulich@sae.org

Jean L. Broge,
Associate Editor
jbroke@sae.org

Patrick Ponticel,
Assistant Editor
ponticel@sae.org

Jenny R. Hessler,
Assistant Editor
jhessler@sae.org

Ryan Gehm,
Assistant Editor
rgehms@sae.org

Kami Buchholz,
Detroit Editor

Linda Trego,
Correspondent

Wayne Silvonic,
Production Manager

Christian Bonicky
Katie Korol
Bill Schall
Contributing Artists

iQBus aids X-by-wire design

Avant! Corp.'s iQBus system was developed to assist engineers in the development of X-by-wire systems, such as brake-by-wire. The company is displaying the system this week at Booth 859.

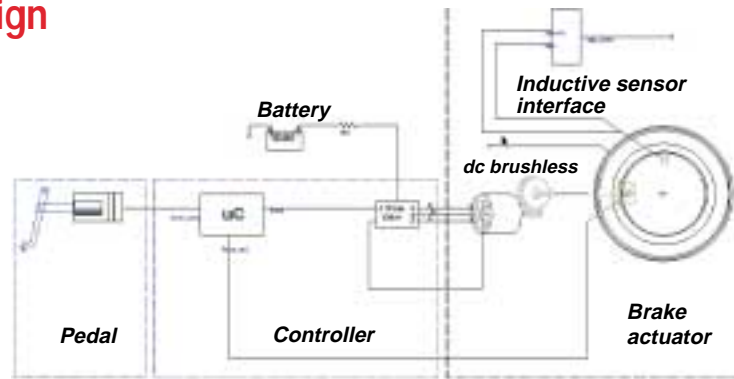
Because of the growing number of system variants, companies cannot test or predict the behavior of a final product with real hardware prototypes, according to Joachim Langenwaller and Bryan Kelly of Avant! Corp. Therefore, they must use an integrated tool package to design, simulate, and document systems used in automobiles, trucks, buses, trains, and other vehicles. Designers need to manage the design, prototype, and tests of their latest systems in a virtual environment.

Using iQBus, engineers begin a new design by investigating system architectures and defining major modules, their positions in the system, and their connectivity. The topology analysis leads to requirements for the subsystem design. Components are then defined and connected by wires (2-D/3-D cable drawings). A virtual verification using simulation follows every revision to check the functionality against specifications and to apply a modification or redesign if the system does not match specifications. Real subsystems then replace virtual subsystems step by step, which requires that a virtual subsystem run in real-time to evaluate the system with real hardware-in-the-loop. Finally, the designer must document the system and send it to manufacturing.

Building a virtual prototype of the design requires "models" to enable the analysis. iQBus offers characterization tools that allow users to create models from available data. Input for model characterization can come from a scanned datasheet, measurement data, or simulation coupled with optimization. A built-in optimizer automatically matches the model performance data to measured values. Moreover, the iQBus comprehensive library contains 30,000 parts (models) spanning different engineering disciplines (e.g., motors to microprocessors).

Designers can implement a microprocessor and its software several ways. One way includes using a control algorithm from the control library as a behavior model. Implementation also can occur by importing a foreign-function, C-Code call from a design tool such as **Mathworks'** Simulink/Stateflow, or using an instruction-set microprocessor model with the target code running on it.

Frank Bokulich



iQbus' comprehensive library contains 30,000 parts (models) spanning different engineering disciplines. Parts range from high-level control blocks to physical-component implementations, enabling modeling of systems such as an electromechanical brake illustrated here.

SAE, VDI sign MOU ...continued from page 1

Treasurer, SAE Board of Directors; and Raymond A. Morris, Executive Vice President, SAE.

Meetings are planned on topics such as active and passive safety, fuel-cell development, and improvements to and support of meaningful international legislation. The memorandum is expected to greatly facilitate the dissemination of technical knowledge between members of both organizations.

One overriding goal of the agreement is to serve the interests and needs of both societies' members as well as engineers in general—and the organizations they represent in both countries. It aims to encourage the participation of members in joint events for the dissemination and exchange of technical information. The technical divisions and groups, as well as young member sections, of each organization will be encouraged to work with the corresponding sections of the other. The SAE and the VDI agreed to arrange activities

in their home markets cooperatively, though collaborative events with other engineering organizations in markets outside North America and Germany will be encouraged.

VDI and SAE also signed a visiting membership agreement, allowing members of both organizations to benefit from member discounts on publications and meeting registrations. During temporary stays in each partner's country, members of the SAE and the VDI will enjoy the same rights and benefits as members of the host organization with regard to the facilities, services, and programs under the same conditions as those granted to host members. In the case of joint events, responsibilities will be assigned in the early planning stages, accompanied by the setting-up of a conference committee with experts and staff members nominated by the SAE and the VDI.

Kevin Jost



AEI Tech 2002 Awards

Each day, AEI Show Daily editors highlight some of the top products and technologies on display at the SAE 2002 World Congress.

Anti-pinch protection

Mayser's anti-pinch protection systems for side windows are equipped with pressure-sensitive sensors. Two conductive surfaces are either integrated directly in the rubber seal of the window or are inserted in an additionally mounted rubber profile. If something gets caught between the rubber and the window, the contact is closed and the window movement is stopped or reversed. An advantage of the pressure-sensitive protection is its extremely short response time. In addition, the switching behavior of the sensors is consistent; the weather and strong vibration do not affect it. The sensors switch only if a small amount of pressure is applied to them. The company is currently working on a presence sensing anti-pinch protection system that uses ultrasonic technology. Ultrasonic sensors can be used in power roofs for convertibles that require other solutions because of a lack of a solid frame.
Booth 3148



Road wheel material

The first prototype road wheel using **Thixomat**, Inc.'s Thixomolded component was developed in Japan in a joint effort between



Japan Steel Works and an automotive OEM. The hub of the wheel is a Thixomolded magnesium alloy preform that is warm-forged to improve its structural integrity before it is fastened to the aluminum wheel body using chromium-plated steel bolts. The use of Thixomolding (>30% solids) was necessary to produce high-quality preforms with low porosity levels.
Booth 1454

Crash wall

BIA offers a turnkey measurement system that helps quantify the structural integrity of vehicles in full-frontal, frontal-offset, and side-impact crash test conditions. The system consists of a load cell matrix of 64 independent tri-axial cells that is installed to a frontal barrier face (FMVSS 208) or movable barrier (FMVSS 214). The load cells are capable of impact forces of up to 400 kN (89,900 lb) in the x-axis and 150 kN (33,720 lb) each in the y- and z-axis, with a total accuracy of 0.5% across the measurement range. Test parameters such as load-cell range and auto or



manual calibration are easily configured using a Windows-based PC. The data-acquisition system is installed on top or inside of the load-cell structure to minimize complex cabling and associated losses in accuracy. Communication with the control system is made via fiber-optic cable using IEEE or Ethernet communications protocol.
Booth 751

Electromechanical/electrohydraulic simulation

SIMPLOER from **Ansoft** is a design suite for electromechanical and electrohydraulic systems used in the automotive industry. It covers a range of applications including onboard power networks, 42-V systems design, and electric and electric-hybrid vehicles.



The product combines advanced, non-Spice circuit simulation with a powerful block diagram and a sophisticated state machine simulator. The kernels run simultaneously in a simulator-coupling environment, providing high numerical stability. The coupling technology also provides an open programming interface to include other industry tools. The company's latest release, SIMPLOER 4.2.1, has an extended model generation capability that allows the use of the latest power semiconductor technology. The parameterization process uses SIMPLOER's optimization tool to adapt the model parameters to the required behavior.

Booth 2351

Spinforming systems

Integrated spinforming systems from **Hess Engineering** are used for high-volume automotive exhaust component production. The precise, economical metal-forming technology can accommodate concentric-, eccentric-, and oblique-axis designs. Benefits



include cost savings of 30%, no welding, low tooling cost, high material yield/reduced scrap,

weight reduction, flexible manufacturing, and high reliability.
Booth 2664

Driver attention

Pi Technology's Phantom system allows the driver to manually activate controls without removing concentration from the road



ahead. The system tracks the location of the driver's hand through a combination of proximity sensors on the instrument panel, and the display shows a graphical map indicating the closest control to the hand. When a control is touched, there is an immediate visual indication of that control. The system also features SWorD, a display unit built into the upper rim of the steering wheel. It uses a combination of LEDs and an eight-character matrix display to provide text and graphics information. Because the top of the wheel is visually located at the bottom of a driver's peripheral vision, it can be glanced at while looking in the direction of travel. The display is only activated when necessary.
Booth 1716

SSA sponsors Dual Use Session

The Air Force Dual Use Science & Technology (DUS&T) Program, located at Booth 2567, will be holding an all day session on Thursday, March 7 in Room D2-09/10. This session is designed to provide perspectives on the various aspects for the Air Force's new approach to doing business. The Dual Use Science & Technology (DUS&T) Program will be highlighted as a way for companies within the automotive industry that are interested in the advancement of new and emerging technologies to leverage research dollars and possibly partner in developing new products.

The morning session will include an overview of the DUS&T Program as it applies to the passenger vehicle industry, a presentation on the implementation of new procurement Technology Investment Agreements (TIAs), and a panel discussion reviewing AFRL and Industry project manager experiences with the program. The afternoon session will include technical presentations by past DUS&T project managers.

42-V experts gather at SAE

An executive panel entitled, "42-Volt Standards - A Global Opportunity," is being held today by the SAE Strategic Alliance (SSA) in Room D2-09/10 at 9:00 a.m. The panel will discuss progress and challenges toward true global standardization. Norman Traub, Director of SAE 42-V Initiatives, will moderate the discussion as well as provide the status of standardization efforts for a 42-V PowerNet battery connection.

Tatsuo Teratani, 42-V Project Manager for **Toyota** and chairman of the newly formed 42-V Working Group in **JSAE**, will lead off the discussion with a short preview of the new THS-M 42-V mild-hybrid vehicle that is now in production in Japan. He will then reveal the plans for the newly formed JSAE and IEEJ 42V groups in Japan.

Wolfgang Bremer from Robert **Bosch** GmbH will present a status report of ISO TC22/SC3/WG14, an international team developing the 42-V specification.

Anson Lee from **DaimlerChrysler**, the current Chairman of the USCAR 42-V Working Group, will discuss USCAR activities in 42 V.

Vehicle manufacturers are faced with the challenge of providing more electrical power to offer increasingly fuel-efficient and safer vehicles with additional customer features. Electrical power demand in motor vehicles is expected to significantly exceed the 4 to 5% annual growth rate that has been characteristic over the past two decades. Continued electrification of traditional mechanical loads, such as power assist steering; as well as the introduction of new loads, such as ac power points, will quickly exceed the capability of the conventional 14-V power-generation and distribution system.

A higher voltage system has been the focus of an **MIT/** Industry Consortium, as well as the Forum Bordnetz in Europe. All are in agreement that global cooperation and standardization will be needed. Regional and international efforts are underway to provide the standardization necessary for this important new technology.

Frank Bokulich

What's New from the exhibitors



The SAE 2002 World Congress provides industry suppliers the opportunity to showcase their products, services, and technologies to the global automotive community. Show Daily editors reviews what some exhibiting companies are displaying this year.

Tire and wheel mounting

Burke E. Porter Machinery Co. has extended its expertise into tire and wheel mounting systems, which include a range of systems such as wheel soapers, wheel



loaders, online vision error proofing, weigh stations, turnovers, an active ring inflator, and patented single/double robotic tire mounters. The firm's robotic mounting permits each tire and rim combination to have its own specific routine for tool position, tip angle, starting position, and tool-rotation pattern. An industrial PC with touch-screen operator panel provides clear and simple graphics to guide users through setups, operation, and diagnostics. No robot language is required once the system is set up.
Booth 122

Pressure transducer

The PMP 317 Series from **Druck Inc.** is a group of rugged, on-vehicle pressure sensors that is suited for all chassis and engine pressure measurement requirements, including fuel system, transmission,



manifold and turbo pressure, air-conditioning, braking system, and crank-case pressures. The unit can be powered directly from the vehicle battery, even during the start cycle. It is suitable for measurements where temperature cannot be controlled and reliable, high-performance measurement is required.
Booth 1044

3-D modeling

SolidWorks 3-D modeling software aids in completing product design quickly and accurately, and Microsoft Windows functions such as drag-and-drop, point-and-click, and cut-and-paste are easy to use. Users can create 3-D models from existing 2-D data with enhanced transition tools. Design communication capabilities are featured, including eDrawings, a breakthrough in sharing 2- and 3-D product design information. With the software, users can move components in a 3-D design and see how they

physically interact with each other. Other drawing and part enhancements include exploded drawing views, the ability to split parts into associative models, and the ability to insert loft sections into an existing loft.
Booth 1653



Open-throat crimper

The SP350 open-throat crimper from **Finn-Power** is designed to load bent or angled parts directly into the vertical head without having to pass the piece through the head. The unit is suited to accommodate automotive assemblies, long or oddly shaped assemblies, and combination assemblies. Other features include the ability to handle hose sizes up to 32 mm (1.25 in) and a maximum die opening of 48 mm (1.89 in). The device has a swaging force of 32 t (35 ton), with a capacity of producing 450 swages/hour. Two controller styles are available: computerized VS control and IS controller with swaging diameter controlled via a 10-turn dial.
Booth 1383



Thermofluid dynamics

Software Cradle Co. debuts SCRYU/Tetra for Windows in the U.S., distributed by **Global Vision Technology, Inc.** SCRYU/Tetra is



a multipurpose, computational thermofluid dynamics analysis system with hybrid meshing via tetrahedral, pyramid, and hexahedral elements. The system has three major advantages: the generation of advanced automatic mesh, high computation speed, and powerful visualization tools in one package. It offers an easy-to-use environment for designers to analyze the behavior of thermofluid dynamics in conjunction with most CAD systems. It shortens product design cycles and provides high quality.
Booth 2165

Test tools

Tadco Automotive AB, part of the XDIN Group in Sweden, develops automotive test and diagnostic tools, including a new series of test tools based on PDA's low-cost handheld computers.

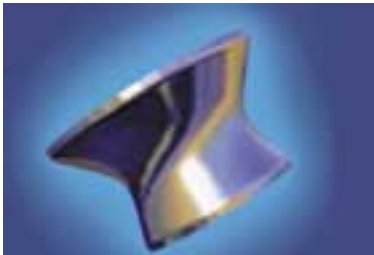


Applications are customized for each client's specific needs. Connection to industry standards (*e.g.*, k-line, CAN, and MOST) is handled by cable interfaces with integrated protocol converters. Wireless Bluetooth communication is available.

Booth 2964

Fastening system

The **AKH Fas-ner** solves problems inherent with other joining methods. Benefits of the system include the ability to join precoated metals as



well as dissimilar metals, electrical continuity at the joint, visual joint quality confirmation, elimination of plating bleed-out, a vibration-resistant solid joint, quality consistency from joint to joint, and high corrosion resistance throughout the joint. The system is a simple punch and die operation that automatically feeds, punches, inserts, and locks the self-piercing, flush-mounted Fas-ner to produce a solid joint in one high-cycle operation.

Booth 2501

Chrome-free coatings

Automotive-approved, completely chrome-free coatings from the **DECC Co.** replace tri/hexavalent-containing materials for coating automotive components. The coatings achieve 1000 hr neutral salt spray and have been tested and approved by the Big 3 automakers.

Booth 1930

Antenna

Amplifier Research's Radiant Arrow 80 is a compact, wide-band, high-gain, true log-periodic antenna that covers the 80 MHz to 4.2 GHz frequency band. It is designed primarily for immunity applications requiring a directive antenna to illuminate large test objects at high field levels. Its beam width is long enough for large test objects. It accepts up to 4000 W input and is portable and easy to assemble. The product's unique " bent-

element" design and small size keep tips further away from the walls of shielded enclosures than traditional designs, reducing reflections and other effects that disturb fields directed at the EUT. A larger antenna of similar design and capability, the Radiant Arrow 26—26 MHz to 4.2 GHz—offers more coverage at the lower end of the frequency spectrum. Booth 1458

Blind threaded studs

SpinTite Type AES blind threaded studs from **Atlas Engineering** provide strong external threads in blind attachment applications for automotive components such as when only one side of a workpiece is accessible for fastener installation and assembly. The threaded steel studs can serve as an alternative to tapped holes, weld nuts, rivets, and self-drilling or tapping screws. They can also act as a locating element when joining two components. Booth 1574



In-dummy DAS

With the new TDAS G5 technology and a partnership between **Diversified Technical Systems (DTS)** and **First Technology Safety Systems**, in-dummy data-acquisition systems (DAS) have been enhanced. The in-dummy systems of the past could only be used in specific dummies, usually with highly modified chest cavities. This limitation was mainly due to the size of the DAS and other packaging constraints. With the TDAS G5, the physical size is less than one-fifth that of any current DAS, and the unique packaging provides easy use in the complete family of crash-test dummies. Some key specifications for the TDAS G5 are less than 4 cm³ (0.24 in³) per channel; 500-*g* shock rated; 20 kHz per channel simultaneous sampling; nonvolatile memory; software adjustable gain, offset, and calibration; and 100BaseT Ethernet communications. It can be used for motorcycle and ejection seat applications. Booth 1016



First-aid kits

First-aid and highway-emergency kits are an increasingly popular accessory for vehicles. **DC Safety's** first-aid kits contain an assortment of quality-tested and inspected medical and safety products housed in a functional and independently



tested synthetic pouch that meets FDA Class 1 Medical Device Requirements. Every highway-emergency kit includes an array of practical products that may be required in case of a vehicle emergency. Customers may choose from a combination of triangular warning signs, thermal rescue blankets, tire pressure gauges, and jumper cables, among other items. Each pouch, whether containing first-aid or highway-emergency products, is designed to meet the customer's specific needs and is tested to meet all federal regulations. Booth 759

Superalloys

Ferguson Metals, a specialty stainless steel and high-temperature alloy service center, is stocking a greater variety of high-temperature alloys, including A286, Hast-X, 625, and 718. Type A286 alloy (S66286) is an iron-base superalloy useful for applications requiring high strength and corrosion resistance up to 704°C (1300°F) and for low-stress applications at high temperatures. Type 625 alloy (NO6625) is an austenitic nickel-base superalloy possessing good resistance to oxidation and corrosion over a broad range of corrosive conditions. The alloy has high strength and toughness, ranging from cryogenic temperature to 1093°C (2000°F). Type 718



alloy (NO7718) is an austenitic nickel-base superalloy that is used in applications requiring high strength to approximately 760°C (1400°F) and oxidation resistance to about 982°C (1800°F). The alloy also exhibits good tensile and impact strength, even at cryogenic temperatures. Booth 527

Fastening and assembly

AT-3 bakeable acrylic tape from **ADCO** works as both a mask during the paint and bake processes as well as an adhesive during parts assembly. It eliminates the need to mask parts prior to painting, and it can be exposed to commercial paint bake cycles multiple times without the loss of adhesion. Booth 2875



System simulation tool

Release 4.0 of AMESim from **Imagine Software** is a system simulation solution for fluid power, powertrain, thermo-fluid, pneumatic, and electromagnetic analysis. Version 4.0 introduces a completely rewritten GUI and software structure. Many new features are incorporated, including multi-layered "supercomponents" and model man-

agement through databases, while retaining the proven numerical solver. A completely new plot manager allows easy manipulation of simulated results and a vast array of plotting options.
Booth 2971

Thermal management software

Flowmaster Group extends the capabilities of Flowmaster2 to provide a single common environment to simulate complex

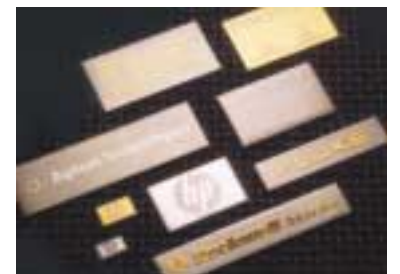


thermal systems in vehicles. Complex interaction of heat flows between different underhood systems such as engine cooling, lubrication, air-conditioning, and in-cabin systems can be simulated for any combination of vehicle and passenger operating condition in the transient domain. The true effect of modifications to individual systems can be visualized on two levels. The effects on individual system performance and on vehicle thermal performance give the design engineer increased visibility to the implications of their changes on the vehicle as a whole. Reduced time-to-market is achieved through the integrated-systems modeling approach, increasing product knowledge at an earlier stage in the design process.

Booth 2513

Nameplate process

GM Nameplate's Electra-Graphics is a new technique in electroplating that creates a detailed, custom graphic in gold or chrome on a stainless steel flat



surface. To manufacture the nameplates, an image on a film layer is applied to stainless steel and a chemical process allows the image to grow onto the steel's surface, forming a raised graphic in gold or chrome. In addition to making an elegant nameplate, the process does not require tooling, which eliminates some up-front costs to customers.

Booth 807

Airbag test chamber

MGA Research

Corp. has recently introduced a new chamber that is used during development of all types of airbags. The system complements an array of test systems and has been designed specifically for synchronized impact testing with airbag deployments at extreme temperatures. It has ample windows for high-



speed camera coverage from a variety of angles. The entire front wall is a large door, which opens by sliding straight up, making vehicle body setup easier since there are no partial walls that can cause obstructions. The chamber also has a provision for rigidly securing a fixture or vehicle buck, which makes temperature-conditioned impact tests easier to perform. It takes 15 s to fully open the door, so the test item is exposed to ambient air for a minimum amount of time. The system is also capable of firing an airbag timed to deploy in conjunction with a dynamic moving impact mass to evaluate airbag effectiveness. The internal space of the unit is 2.4 x 2.4 x 2.4 m (8 x 8 x 8 ft), and the temperature range is -40 to +85°C (-40 to +185°F).

Booth 1020

Self-clinching studs

PEM Type HFHD high-strength, self-clinching dog-point studs from **PEM Fastening Systems** enable reliable and secure attachment of vehicle components and reduce the number of required parts for quicker



assembly and neater, lighter component designs. The dog-point feature ensures quick nut positioning and assembly while protecting first threads from damage. The units can meet increasingly stringent automotive industry certification and quality standards. Applications include bumper supports, engine brackets, airbag assemblies, and fuse terminal posts.

Booth 1576

Data acquisition/analysis

PTrAc/PTrAn from Optimum Power

Technology provides a powerful electronic system for data acquisition and analysis in one package. PTrAc takes advantage of low-cost PC hardware and advanced electronics to produce a high-speed data-acquisition system capable of sampling up to 1.25 MHz in either time- or angle-based mode. The system provides savings in both cost and time over other available systems due to its ease of use and a unique filtering system. Its software-controlled digital filtering system ensures that the correct level of filtering is applied to prevent aliasing of the incoming signals regardless of the engine speed. PTrAn, available as part of the system or as an individual software package, is a high-quality combustion analysis software. In a user-friendly environment, it combines industry-standard computations with enhanced graphical capabilities, reducing test, analysis, and development costs.

Booth 2563



Test and device automation

A modular, PC-based system from **PEUS-Systems Inc.** considers the complete testing, archiving, management, evaluation, and quality control needs of modern testing laboratories in the automotive industry. It focuses on the automation and integration of all measuring devices on test cells as well as portability, open interfaces,

and compliance with international standards. The system can be extended for integration of additional tests, test cells, and devices, including central parameter and data management, networking, and global data access. It provides interface drivers to all existing devices.

Booth 1151

Caged motion systems

Caged ball technology from **THK** includes three product groups: Caged Ball, Caged Roller, and Caged Technology Ball Screw. The firm's most recent innovations include the Caged Roller guide for customers with specific rigidity requirements. THK has also improved the ball screw by incorporating its newly designed ball return tube and an elastomeric



spacer to separate balls, which allows for an increase in maximum nut rpm. The technology isolates each of the load-carrying recirculating elements in their LM guides in an individual cage or pocket. The cage prevents ball-to-ball or roller-to-roller contact and the associated friction, and also acts as a reservoir for lubricants, eliminating the need for an external lubricating system. In addition, the technology offers higher speed capability and improved positioning accuracy.
Booth 115

Fuel hose

Titeflex Corp.'s Zero-E hose combines the proven performance of Teflon polytetra-fluoroethylene (PTFE) fluoropolymer resin in fuel service with an additional barrier layer to reduce permeation and effusion. A patented process is used to bond a thin layer of metal foil to the outer surface of Teflon PTFE tubing. The construction can be covered with a variety of



elastomeric layers and/or braided reinforcement for vapor, fuel, or high-pressure compressed-natural-gas applications.
Booth 2884

Pressure transducer

Viatran Corp.'s 45 Series digitally compensated pressure transducer is the firm's most-accurate pressure transducer (0.05% FSO) for industrial test applications. Temperature range is -40 to +85°C (-40 to +185°F), and standard response time is less than 4 ms. The unit has a 38-mm (1.5-in) diameter, internal calibration, electronic linearization, and optional outputs, as well as alternate electrical connectors and pressure ports.
Booth 801



Programmable power supply

The 6-kW (8-hp) XDC Series from **Xantrex** is a high-power, programmable dc power supply. The device



has an embedded controller that provides menu-driven auto-sequencing capability, which allows the user to enter and save complex test sequences via the front panel without requiring external computers or software. It provides 20% more power than competitive 5-kW (6.7-hp) units and offers up to 10 different test programs, each with up to 99 voltage-level steps varying from milliseconds to days.
Booth 1130

Combustion analysis

SMETEC's COMBI-USB eight-channel combustion analysis system was designed for rough use in automobiles. With the with an ordinary notebook computer. The engineer can use the board power supply without a voltage converter. The system is also designed for the future 48-V board net. It will be delivered with a standard four-channel hardware configuration, including COMBI software that is compatible with all COMBI systems. The compact design does not allow addition of further features that are available at COMBI-Pro and COMBI-Exec. Nevertheless, COMBI-USB is a full-size combustion analysis system for solving all daily problems. The hardware configuration is the same as COMBI-Pro and COMBI-PC. Every channel has a 500-kHz resolution with a 12-bit accuracy.
Booth 2929

Mobile data acquisition

Validyne Engineering's VDAS 200, 800, and 1500 mobile data-acquisition systems can record up to 300 channels of vehicle sensor inputs with 1000-V isolation and cold reference junctions on each channel. Other key design features include analog-to-digital converters on each channel, a combined thermocouple and voltage input module, and



multiple software options including LabVIEW. Cold-cranking operation for supply voltages down to 5 V dc and resistance to temperatures from -40 to +85°C (-40 to +185°F) enable the systems to perform and deliver accurately in the most severe test conditions. Applications include vehicle HVAC, wind-tunnel, altitude-chamber, and most forms of high-channel-count testing.
Booth 938

Xenon arc testing

Q-Panel Lab Products' new Q/B filter for the Q-Sun xenon test chamber is an affordable product that meets the spectral requirements for SAE J1885 and SAE J1960. The filter has equivalent transmission to the quartz inner filter/borosilicate outer filter combination. A full-spectrum, full-featured chamber, the Q-Sun is used to test materials for weatherability and light stability. It uses xenon arc lamps to simulate the entire spectrum of sunlight, including UV, visible light, and infrared. Filters are used to achieve an appropriate spectrum based on test protocol or application.
Booth 536



Parts testing

RMMP Testlab, Inc.'s Automotive Parts Testing Laboratory is an A2LA accredited laboratory complete with a fully staffed fixturing department with the ability to construct accurate and durable exposure and cycling test fixtures. Programmable hot/cold/humidity cycling chambers with capabilities of -70 to +180°C (-94 to +356°F) with 10-98% humidity are available for a multitude of common environmental exposure

cycles. An 8.9-kN (2000-lb) vibration system is available for sine and random vibration as well as shock testing of parts at any temperature. Walk-in conditioning chambers can be programmed for extreme hot and cold environments for large part testing such as headliners, seats, and body bucks, which require environmental conditioning and/or cycling at temperature.
Booth 666

Data recorder

The GSR20f and GSR40f systems combine the flexibility and power of **Thales Heim Data Systems'** D-Series flight recorder



architecture in an economical, rack-mountable, ground-based system. With up to 20 Mbit/s total system rate for the GSR20f, 160 Mbit/s total system data rate for the GSR40f, and potential migration to even higher data rates, the system provides a solution for ground-based telemetry, satellite down link, multi-channel analog, and bus recording. The record and/or reproduce system employs media in interchangeable cartridges, allowing the user complete freedom of choice between tape, disk, and solid-state drives at any time during the life of the equipment. The media cartridges use a standard SCSI interface that also allows the system to act as a front-end multiplexer to any other external media/drive having compatible protocol. The mainframe has six signal module slots that can accommodate any combination of the existing and future D Series signal interface modules. A built-in PC allows flexible interfacing to networks and other interfaces for data distribution.
Booth 739

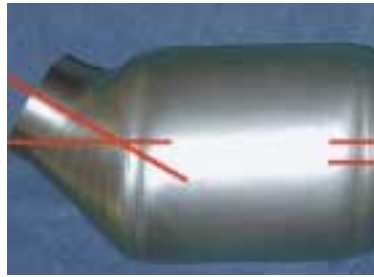
Steel wheel

The Kühl Wheel, patented by The Epilogics Group and manufactured by Hayes Lemmerz Intl., is a fabricated steel wheel that offers the styling flexibility of an alloy wheel at the cost of a conventional steel wheel. Its all-steel construction and enhanced brake-cooling characteristics make it especially suited for heavy-duty applications such as trucks and SUVs. Its corrosion resistance and low cost make it ideal as a winter wheel in snow-belt regions. Booth 2071



Spinforming systems

Integrated spinforming systems from Hess Engineering are used for high-volume automotive exhaust component production.



The precise, economical metal-forming technology can accommodate concentric-, eccentric-, and oblique-axis designs. Benefits include cost savings of 30%, no welding, low tooling cost, high material yield/reduced scrap, weight reduction, flexible manufacturing, and high reliability. Booth 2664

Pressure sensors

Kavlico's P155 and P195 high-performance pressure sensors are suitable for a variety of motorsports applications. Engine



builders and dynamometer operators also use the sensors for applications such as manifold absolute pressure, boost pressure, oil pressure, fuel pressure, NOx bottle pressure, hydraulic-brake pressure, air-suspension pressure, pneumatic-system pressure, and aerodynamic pressure. The sensors feature stainless steel housings, male or female process connectors, EMI and RFI protection, o-ring options for process media compatibility, and pressure ranges from 0-100 kPa (0-15 psi) through 0-20,700 kPa (0-3000 psi) gauge, absolute or sealed. They also provide a linear voltage output of 0.5 to 4.5 V dc and install easily due to their small size and weight. Booth 1335

Charge meter

The 5015A piezoelectric sensor charge meter from Kistler Instrument combines the features of a traditional charge

recording and storage of up to 100 measurands and their statistical evaluation, viewing, and editing. Instantaneous, peak,



amplifier with a digital-measurement meter and signal-analysis instrument. All operational features are menu driven. Features include an extended measuring range; both digital and bar graph display of measured values; and

average, and min/max values along with the number of samples are captured and indicated. A measuring widow function allows signal evaluation of one or two measuring cycles. Booth 811

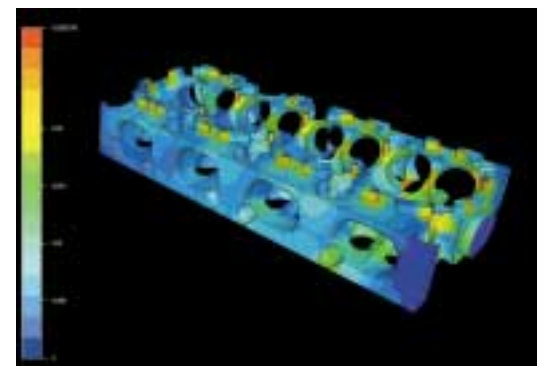
Inertial sensor

The MX2000 from MEMSIC, Inc. is a fully integrated two-axis sensor built on a CMOS platform. The device offers inertial sensing on two independent axes and is available in a wide range of sensitivities, *g*-sense levels, and output modes. The available acceleration sense options include $\pm 1 g$ to over $\pm 50 g$ full scale, all of which operate continuously with a supply voltage range of 2.7-5.5 V. Unlike conventional MEMS, the product is offered with either analog (true ratiometric or ideal absolute settings) or digital PWM output modes, allowing for minimization of component count/cost as well as direct facilitation of microcontroller interface. Booth 1385



Fluid flow

Blue Ridge Numerics' CFdesign 5.0 software has a high level of integration with leading CAD systems such as Autodesk Inventor and Mechanical Desktop, Solid Edge, SolidWorks, and Unigraphics. This capability means that changes to the CAD model are automatically reflected in the analysis model, eliminating the time-consuming task of recreating data. The software for fluid-flow and heat-transfer analysis provides a meshing enhancement feature that automatically produces an optimized



mesh. Once the simulation is complete, its dynamic, interactive display system lets users explore their simulation results with tools such as clipping planes, dynamic rotation, and particle tracing. Booth 2163

Aluminum manufacturing

The CastClad manufacturing technology was developed at the **Institute of Materials Processing of Michigan Technological University** to manufacture steel-surfaced aluminum components. In the process, a selected thin steel piece(s) is treated and inserted into a sand/metal mold, then molten aluminum is poured into the mold, similar to a normal metal-casting process. The thin steel piece bonds strongly with aluminum. The integrated components are lightweight, high-strength, and ductile; have good wear resistance; and can work at high temperatures on critical surfaces to meet the requirements for various applications. The process is suitable for high-volume production at low costs.



Booth 2444

Virtual prototyping

The Teamcenter Automotive Solution from **EDS PLM Solutions** provides significant value to automotive organizations as they continue to improve collaboration along the supply chain. Specifically tailored for automotive suppliers, the solution provides fast, cost-controlled, deployable capabilities tailored to supplier data, processes, and standards, enabling suppliers to comply with the requirements of production and manufacturing standards.

The firm also has developed Vis Concept 3.0, a scalable, complete virtual prototyping solution that enables designers to present high-resolution, realistic 3-D and 2-D designs on desktop computers or in immersive environments such as CAVEs, Powerwalls, and Desks. Version 3.0 includes enhanced capabilities for texturing, shadowing, 3-D text generation, and presentation application upgrades.

Booth 3211

Design sharing

Actify 3DView 4.0 from **Actify, Inc.** enables users to view and share product designs without requiring a full-feature CAD system, a costly workstation, or CAD training. With the latest release, design and manufacturing professionals can easily and cost-effectively communicate 2- and 3-D designs along with comments directly via



e-mail or the Web to customers, vendors, suppliers, and manufacturers. Benefits include reduced time required to discuss design data and communicate feedback; design information is more readily available and easier to understand; and training time required to access and share designs is reduced. The release also includes real-time rotation, large design navigation, advance measurement, markup, design analysis, and Web design exchange. It supports all major CAD systems, including Inventor, Mechanical Desktop, CATIA, IDEAS, SolidWorks, Solid Edge, and others.

Booth 2528

Manufacturing management

Version 2.60 of **Polyplan Technologies'** PolyCAPP not only provides companies with the core set of manufacturing engineering tools such as collaborative process planning, but it also includes unique tools for change and knowledge management, and affectivities. The new functionalities allow the software to integrate with report-generating tools such as Oracle

Reports and Crystal Reports, simplifying the task of creating contextual reports. Advanced management reports allow detailed follow-ups. New search-engine functions allow for better reuse of manufacturing know-how, better management of manufacturing engineering data, and quick access to information.

Booth 2251

Engine technology

A new engine from **LIM Technology**, the forced coaxially ventilated two-stroke powerplant, could be either diesel or direct injection. It does not use mechanical, electronic/electrical, or magnetic management of the valves, and there is no camshaft or valvetrain. The valves are only for intake; exhaust flows away through a ring of ports around the cylinder, positioned so they are exposed by the piston as the power stroke ends. Air, under pressure in the intake manifold, forces open the intake valves to allow air to stream through the cylinder, displacing the prior cycle's waste gases and also cooling all internal surfaces. Unlike generic two-strokes, the crankcase is only used as the home of the crankshaft and normal lubricants. The pistons have at least one ring around the lower piston skirt, which will intercept almost all blow by gases, protecting the oil from contamination by organic acids. By producing a power stroke in each cylinder for each revolution, nearly twice as much power is available from a given displacement as in a four-stroke engine. The company hopes to have the technology ready for the test bed by spring 2003.

Booth 540

In-die tapping

Pronic's thread-forming technology eliminates the need for costly and cumbersome secondary thread-tapping operations. It puts



the thread directly into the pierced or extruded piece part, unlike other stamping fastener technologies such as clinched (or crimped) nuts, riveted nuts, or welded nuts that can be prone to performance problems. Since the technology uses roll-form taps, no metal chips are produced in the process. The results are up to 20% stronger than conventional cut threads due to work-hardening inherent to the process.

Booth 3210

Scroll compressor

The MCC (Mitsubishi Climate Control) scroll compressor from **Mitsubishi Heavy Industries** is designed for reduced size, weight, and noise compared to conventional rotary, swash-plate, or wobble-type compressors on an equal displacement basis. Available with or without a capacity-control feature, the compressors run quietly, are highly efficient and reliable, and have minimal vibration. Since no suction valve is required, and because of the implementation of an independent suction chamber, volumetric efficiency is high. With advancements in production machining and assembly equipment, MCC scroll compressors can be made in high volume to support automakers' production requirements.

Booth 1723

Wetting-resistant membranes

Hydrophobic membranes in automotive applications often come in contact with various automotive fluids. Many of these fluids have low enough surface tensions to wet the membrane, decreasing its venting capability and thus preventing airflow. Membranes treated by **Pall Corp.**'s FluoRepel process, such as Versapor R and Supor R, were

found to resist wetting by automotive test fluids. Fluids evaluated included starter, brake, transmission, steering and wiper fluids, motor oil (10W30), gasoline, radiator coolant, 5% saline, water, and isopropyl alcohol. The two membranes also allowed airflow following contact with the test fluids.
Booth 2713

Jumper system

The **Panta Sumida** fix jumper system from **Sumida America Sales** is a line of flexible, flat conductor connectors combining the properties of flat cables and connector pins. They are designed for use in places where electrical connections require high flexibility and/or the printed circuit boards to be connected are subject to vibrations. They pass the high vibration requirements of the automotive industry. Products can be specified a number of ways, and there are at least seven types of terminations from which to choose.
Booth 2978



Test chamber

Cincinnati Sub-Zero's Z-Plus test chamber incorporates many customer-requested features and extended performance for fast ramp rates. Chamber construction provides customers with the flexibility to incorporate both left- and right-sided ports/slots, a



hinged control platform with a choice of a standard or touch-screen chamber controller, and the ability to locate the chamber against the wall. Access is provided to all systems via easily removable side panels. Standard sizes range from 0.23 to 0.91 m³ (8 to 32 ft³) workspace volume with a temperature range of -73 to +190°C (-99 to +374°F) and a humidity range of 10-98% RH. Standard features include a one-handed latch, high-volume airflow, quiet operation, leveling legs, shelf, viewing window, interior chamber light, 76-mm (3-in) port, and top-vented exhaust.
Booth 1036

Leak detector

Alcatel's ASI 20 MD modular leak detector is composed of three separate modules for maximum flexibility of integration; all are 19-in rack compatible. The unit offers an analyzer cell equipped with dual filaments and a patented electron multiplier preamplifier for high sensitivity. The compression ratio of its high-vacuum pump allows leak testing at a pressure as high as 2 kPa (15 torr). The inter-stage of the high-vacuum pump allows leak testing in the fine leak mode at 0.2 kPa (1.5 torr) to eliminate the effect of moisture on cycle time. An auto-calibration system has built-in temperature-compensated calibrated leak detection. The system also features a user-friendly flat control panel with direct key functions and a mechanical design for optimized integration.
Booth 2960



Digital image analysis

The **View** optical imaging system from **Atlas Material Testing Technology** quantitatively analyzes surface defects created by physical, weathering, and corrosion testing. The system provides objective and quantitative ratings in describing surface defects and textures on coated surfaces of automotive exterior/interior materials. Compared to visual inspections of these defects where subjectivity or ratings may exist, the optical imaging system provides objective, repeatable, and quantitative data and ratings. The



software can be tailored to provide industry standard ratings. The system is equipped with a special optical hardware to visualize top-coat (clearcoat) defects of automotive exterior paint.
Booth 1049

Accelerometer

Endevco Corp.'s Model 27AM1 Isotron accelerometer is a small, adhesive-mounted device with integral electronics designed specifically for measuring vibration on lightweight structures such as automotive components, miniature electronic devices, and other small objects. The 2-g (0.06-oz) accelerometer offers high resonance frequency and a bandwidth of 0.3 to 20 Hz. Its light weight effectively eliminates mass loading concerns. Packaged in a hermetically sealed, titanium case, the unit measures 6.4 mm (0.25 in) wide, 10.8 mm (0.43 in) long, and 4.8 mm (0.19 in) high. A field-replaceable, flexible, miniature cable is supplied with the accelerometer and mates to the outside thread M3 receptacle of the unit. The device features a Piezite Type P-8 crystal element operating in annual shear mode, which exhibits good output sensitivity stability.
Booth 843



Small borescope

Inspectors, technicians, and operators can look inside small bores, deep holes, tubes, or pipes with the **Hawkeye SuperSlim** borescope from **Gradient Lens Corp.** With a 2.4-mm (0.09-in) diameter, the unit fits easily into small spaces. A mirror attachment for a sideways view brings the diameter to 2.8 mm (0.11 in). It lets users check for defects such as burrs, cracks, roughness, pits, or tearing; inspect machined parts, molds, and solder joints; and check fuel injectors, transmissions, and engine injectors. The device saves time and labor costs, helps technicians troubleshoot and diagnose problems quickly, and improves quality control. It includes a battery-powered Mini Maglite to illuminate whatever is being examined.
Booth 1873

Motorola engineers simulate CAN, LIN communications

With more and more electrical components and computation power being integrated into vehicles, a communication network is needed to reduce the complexity of the vehicle wiring harness, increase reliability of the overall system, and enhance the flexibility of the entire system layout. Controller Area Network (CAN) is one type of in-vehicle network standard developed by European OEMs in the past 10 years and has been adapted by U.S. OEMs in the past two years. Integration of a cost-effective, reliable CAN network can be a difficult task. Discovering system-level communication network problems, identifying ECU impacts at early development stages, and gaining more confidence of the CAN network behaviors are all critical goals, according to **Motorola** engineers who spoke yesterday at the In-Vehicle Networks technical session. Vehicle-level CAN network modeling and simulation is one way to start answering these problems.

Engineers at the Motorola Virtual Garage of Detroit modeled and simulated a whole-vehicle CAN network and selected *eArchitect* from **Innoveda** to set up the vehicle network simulation environment. For demonstration purposes, they constructed a vehicle-level CAN communication strategy, which is captured in the Vector's CAN database format. This communication strategy includes three CAN sub-networks (CAN B, CAN C, and CAN Diagnostic) and requires gateway functionality to share signals between different CAN sub-networks.

The models used in the simulation were developed using the EML language used in *eArchitect* and captured in the library format. Modeling vehicle communication protocols is the key for vehicle network simulation. The capability of modeling networks including CAN, LIN, MOST, J1850, and TTP is the heart of vehicle network simulation. In this simulation, researchers implemented CAN communication protocols based on CAN specification 2.0-B.

The outputs of simulation provide rich sets of information regarding vehicle network behaviors, node behaviors, and communication task behaviors. In addition to the *eArchitect* analysis tool, the post process tool developed by the Motorola Virtual

Garage of Detroit provides a convenient method to analyze the simulation results further.

The use of CPU and throughputs of the communication bus are important for a message strategy design. With this simulation environment and the analysis tool, simulation results can provide detailed insight before the actual vehicle network is built. System engineers will be able to use this information to define a CAN message strategy intelligently and be able to control system integration and system latency time better.

The CPU performance of each node also plays important roles to maximize CPU use and guarantee the required performance. This simulation environment provides information on the CPU load due to the communication tasks. With a proper OS model (such as OSEK) and task scheduling running on the OS, this setup can also be used to analyze the

performance of an OS and the efficiency of the scheduler.

This simulation environment has been used to conduct several studies of CAN networks, LIN networks, and mixed CAN/LIN networks to validate message strategies. The simulation environment also has been validated through hardware setup with good correlations.

The future for this simulation environment will include introducing OS into the CPU model and more communication protocol models. Introducing OS will improve modeling of CPU performance, which will lay down the foundations for the simulations of a distributed system.

Linda Trego



Engineers at the Motorola Virtual Garage of Detroit can model and simulate a whole-vehicle network.

Implementing DfE in door-panel design

As a result of the impending European End-of-Life Vehicle Directive and other drivers such as supply-chain information requests, many Tier 1 automotive suppliers have begun implementing Design for Environment (DfE). However, there is no standard way of implementing DfE and few guidelines for designing successful DfE programs. Companies can begin by selecting a case study design to gain experience, understand the challenges, and determine the best method for implementing DfE.

As part of a partnership of public and private sector organizations, researchers at **Magna** International and **Five Winds** International carried out a DfE case study, details of which were revealed at Tuesday's Design for the Environment and Environmental Management Systems session. The case study was implemented using a comparison of an existing door panel and a DfE concept panel at Magna. The process involved using several DfE tools, including checklists and LCA (Life Cycle Assessment), to determine the key environmental aspects of the two designs. The findings from this exercise were used to produce a report on the integration of eco-efficiency and DfE into the product-development process of the automotive industry. The case study is one part of a larger training module on DfE for the automotive sector.

The outcome of the analysis was surprising. The lack of significant differences between the door systems in the analysis was not expected by anyone in the project team.

The use of the life cycle approach in the context of Design for Environment has proven to be valuable where important business decisions are being considered. By focusing on only one stage of a product's life cycle, environmental tradeoffs in other stages can occur. Recyclability alone does not render a product environmentally friendly. This case study demonstrated an important trade-off when designing for recyclability alone. If a system requires more energy to operate during the use phase, benefits at the end-of-life may be negated.

Life cycle thinking, tools, and techniques provide an excellent business tool for comparing technologies and highlighting improvement opportunities. Using a predefined methodology for DfE assessments provides many business benefits. Companies can benefit from Design for Environment activities and analysis when planning long-term strategy for technology advancement and capital investment. The systems perspective life cycle method helps companies avoid making hidden compromises, reduce costs, avoid future liabilities, and plan product strategies.

Linda Trego

Padilla to speak at banquet

James J. Padilla, Group Vice President of Ford North America at Ford Motor Co., will be the featured speaker at the SAE 2002 World Congress Annual Banquet tomorrow from 7:00 to 9:00 p.m. in Cobo Center's Riverview Ballroom.

Tickets for the banquet are available in Congress Central (W2-60) for \$125 or \$1250 per table. Dress is business attire.



James J. Padilla

Denso controls for Toyota mild hybrid

With the reduction of CO₂ emissions becoming a crucial international issue in recent years, Toyota introduced the Prius, a mass production passenger car equipped with Toyota Hybrid System (THS), in 1997. A combination of a gasoline engine and an electric motor is incorporated into the vehicle, which has sold about 60,000 units so far. However, to facilitate more extensive use of such low-pollution cars in years

tendency of increasing electric loads in vehicles. It is promising as a next-generation power supply system for vehicles, not only in terms of ensuring an adequate power supply capacity, but also in weight reduction with a thinner wire harness and the conservation of resources.

Under such constraints, Toyota developed another hybrid system called Toyota Mild Hybrid System, which is intended for wider use

- When stopping vehicle—The engine stops promptly and smoothly under the direction of a motor/generator (MG). Upon request for activation of the air conditioner or power steering (PS), the air conditioning compressor or PS pump can be activated with the engine stopped (in auxiliary equipment driving mode).

- When starting vehicle—The moment the brake pedal is released, the MG starts the vehicle (in EV driving mode). When the driver steps on the accelerator pedal, or after a given period of time has passed, engine firing occurs and the engine-driving mode starts.

- When running in ordinary conditions—The vehicle runs powered by the engine.
- When decelerating—Upon braking, the wheels activate the MG for power regeneration, and some of the brake-deceleration energy is recovered and stored in the battery.

As a result of these operating modes, vehicles equipped with this system have fuel economy benefits of 15% (in Japanese 10-15 mode) in comparison with conventional vehicles.

The easy-to-install 42-V mild-hybrid power control system for was developed and introduced for application to various vehicle types. Features include:

- The belt-driven MG (motor/generator) to start the engine occupies the same location as the conventional alternator.

- The inverter unit uses a newly developed Ellipse-type aluminum capacitor, and size is reduced by integrating the ECU for mild hybrid system control. The reduction in both size and power loss is achieved by employing the MOSFET module for power modulation.

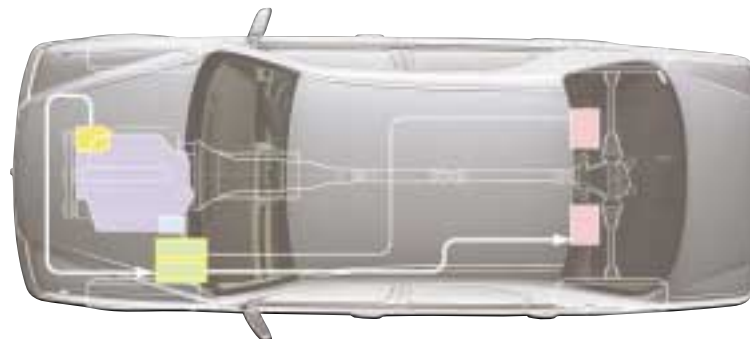
- The efficiency of the dc/dc converter is enhanced using synchronous rectification, and its size is reduced via a high-speed switching device.

Since the system can be installed easily on other powertrains, it is highly practical. Developers expect that the system will facilitate the more extensive use of low pollution cars in years to come.

Linda Trego



The main components of the Toyota Mild Hybrid System (shown on Japanese market Crown sedan) are a motor/generator, inverter, and 36-V lead-acid battery.



to come, it is vital to develop systems that are less expensive than the THS. These systems must be simple and easy to install, yet applicable to various types of vehicles with general-purpose functions.

According to Toyota and Denso engineers in a presentation at Tuesday's 42-V Technology technical session, greater electrical power is needed for proper hybrid system functionality. International standardization activities for the 42-V PowerNet, which are conducted mainly in the U.S. and Europe, are addressing the need to increase the battery voltage to 36 V. This addition is in line with the

than THS. This system can be added to conventional vehicles with minimum modifications of existing powertrains. A 36-V drive battery is added according to the overall criteria of safety against electric shock, operating performance, cost, and technological advances. It is the first 42-V/14-V dual battery system to be developed in the world.

The Toyota Mild Hybrid system is aimed at reducing exhaust gas emissions, fuel consumption, and idle noise by adding new functions—idle-stop in particular—to conventional internal combustion engines. The following functions are provided according to vehicle running conditions:

Lighting design help from Optis

Modern demands on automotive lighting mean that a designer's job is becoming increasingly challenging. Numerous factors must be taken into account when designing an automotive lighting component such as safety,

comfort, appearance, ergonomics, and lead times—not to mention cost. To help the lighting designer confront these challenges, **Optis** has developed a new kind of CAD software specifically for lighting simulation. Developed

and used by the company's team of optical engineers and IT specialists, its SPEOS package addresses the design, analysis, and realistic rendering of any lighting component found on a vehicle. The software takes into

account SAE standards for automotive lighting components and has a dedicated module to ensure adherence. Optis is organizing a seminar to launch the new version of SPEOS, with key speakers discussing how the field

of computer-aided lighting design is evolving in the automotive industry. The seminar will take place Friday at the Hotel Ponchartrain. For more information, visit Booth 2075. Kevin Jost

Surviving in the injection-molding market

In the great injection-molding industry shakeout, **United Plastics Group**, Inc. (Booth 2849) is a survivor. And by taking aggressive measures, the company expects to grow its share in the automotive market.

Hundreds of injection-molding companies have gone under or have been bought out because of price pressures over the past 18 months, according to John Szkutnik, Vice President of Sales and Marketing for United Plastics. Others, such as **Key Plastics**, have filed for Chapter 11. "The market is absolutely saturated," he said.

Which has forced privately owned United Plastics to improve its capabilities by adopting lean manufacturing techniques, expanding its supply base, "and doing some other things we wouldn't have otherwise done." The company also believes success depends on partnerships such as the one it formed with **Daltek** for a joint venture in China, enabling the company to become the one-stop supplier its customers are demanding of all suppliers.

Customers are also demanding that injection molding companies pay tooling costs up front, with the customer repaying those costs over a given number of years as product is delivered. Customers used to hand suppliers a check up front for tooling costs. "So, we're becoming a bank, more or less," Szkutnik said.

Because of projections for lower vehicle production in the U.S. this year, United Plastics is focused on gaining market share. Automotive accounts for about 13% of sales now; with "lots of new business for 2003," the Tier 2 supplier expects that figure to increase by 40%.

Formed through a merger of five companies in 1998, United Plastics has plants in Wales and Mexico in addition to China and the U.S.

Patrick Ponticel

Some metals near end of life

A European Union (EU) directive that limits hexavalent chromium on vehicles has put automakers and the supply chain on notice. Fasteners, clips, connectors, tubing, and steering and brake components are among parts typically dressed in coatings that contain chromium. Other metals, including lead and mercury, also are absorbing risk-assessment attention in an eco-friendly climate.

"Our overriding philosophy is to reduce the risk to people and the environment from substances of concern," said Monica Prokopyshen, Senior Specialist for Pollution Prevention & LifeCycle Management, **DaimlerChrysler Corp.**, and moderator of a Tuesday morning vehicle-lifecycle panel discussion.

Amid the good eco-design intentions are swirls of ambiguity about the directive—taking effect on July 1, 2003—that states hex-chromium may not represent more than 2 g (0.07 oz) per vehicle. One cloud covering the policy: how it will be enforced. "We're in a situation of 'that's the law,' but we don't know how they're going to measure compliance," said Prokopyshen. To deal with the uncertainty, the automaker will enact self-certification.

DaimlerChrysler is preparing to inform its vendors via e-mails and/or letters what metals are on the banned or restricted list and that the automaker is self-imposing a no hex-chromium rule as of July 1, 2002. "The one year ahead (date) helps clear out the pipeline of parts with hex-chromium," said Ronald Lash, Senior Specialist for Metal Finishing & Coatings, Body Materials Engineering, DaimlerChrysler. There is speculation that the imposed limit on hex-chromium may vanish since it is a noticeable threshold.

Failure to comply with the EU directive may or may not come with a citation. "No one really knows what the penalties are going to be," said James English, Vice President of the Automotive Division for **Plating Technology Inc.**, a metal finishing company. For metal finishing companies, eliminating hex-chromium impacts equipment, assembly lines, and basic processing methods.

The point of initial exposure to a banned or restricted substance may occur early in the processing chain. For example, an additive initially used as a mold-release agent eventually could surface as an end-of-vehicle-life coatings contaminant.

When product sustainability assumes a crucial role in design and development considerations, end-of-life vehicles freely transition into an eco-afterlife. "By having a better understanding of materials used in vehicles, OEMs and suppliers can design out materials that are banned or restricted," said Andrea Russell, Strategic Management for **Five Winds International** of Ontario, Canada.

Kami Buchholz

The driver distraction dilemma

Driving on a flat, straight highway during daylight hours when the weather is wonderful may not sound like a particularly dangerous driving situation; however, a majority of accidents occur under these exact circumstances, according to Barry Kantowitz, Director, **Univ. of Michigan Transportation Research Institute (UMTRI)**, and a participant in the "State of the Industry for Driver Focus Research" panel presented by **Motorola** yesterday afternoon.

"Accidents happen when the world appears okay," said Kantowitz. Psychological causes for driver distraction include "switching," when mental attention is working on one process and not another, and "starvation," which means there is insufficient mental processing capacity at a particular moment. He also pondered what an "intelligent" vehicle might want to know in order to keep operating.

Some of these criteria are vehicle parameters such as velocity and lean position; telematic demand (collision avoidance, entertainment and convenience functions, etc.); local environment such as traffic; and driver characteristics including age, alcohol detection, hours of service, and whether the driver is eating.

"We should consider the option of a completely autonomous car [that can] operate independent of the driver" to help curtail driver distraction, said Kantowitz. He also presented various ways of removing distractions, including warning labels and government regulations on such things as cell-phone use, but concluded that "the best solution is good engineering design. If you build it right to begin with, then you won't have driver distraction; no telematic device would add to driver distraction. And where does good engineering

design come from? It comes from good engineering judgment, and that comes from making mistakes."

The session also highlighted some of the goals of and research deriving from the Motorola Research Summit held in August 2001. Some areas for which answers were sought include the effects of various in-vehicle, secondary tasks on drivers; how an intelligent agent could be used to manage information flow to focus drivers' attention; and the characteristics of cell-phone users and their patterns while driving. Paul Green of UMTRI detailed a current research project focusing on cell-phone users. The research should be completed this spring, said Green.

Other panelists included John Lee of the **Univ. of Iowa** and Mike Gardner, Director of Intelligent Systems Research Lab, Motorola. Ryan Gehm



The Omni-Directional Inspection System (ODIS) on display at the National Automotive Center's Booth (926) in the Test Group area is a self-propelled, low-profile robot equipped with a small camera to inspect vehicle undercarriages for bombs and other contraband. The ODIS (left) consists of a pan/tilt camera assembly; steering/drive assemblies; battery packs; and sonar, IR, and laser sensors. The operator drives the robot using a joystick on a handheld operator unit (upper right). ODIS was developed by the U.S. Army Tank Automotive Research, Development, and Engineering Center (TARDEC) and Utah State University under the OSD Joint Robotics Program's Intelligent Mobility Project.

Exhibitor Directory Addendum

The following is a listing of new exhibitors as of March 5, 2002.

New Exhibitors

Pi Technology

Milton Hall, Ely Rd.
Cambridge, UNITED KINGDOM
<http://www.pitechnology.com>
enquiries@pitechnology.com
Booth 1716 and 5525

A world leader in the provision of electronics and software solutions for the automotive industry. The company has extensive experience of electronics and embedded software for engine controllers, gearbox, HEV and distributed architecture, telematics systems, body control, instrument clusters and vehicle infotainment, together with offering a dedicated hardware-in-the-loop simulator. This year, Pi Technology will be showing its automotive controller development expertise with an advanced rapid prototyping approach to X by wire systems; also on display is the Pi AutoSim hardware-in-the-loop simulator connected to a automotive test bench.

Secretariat of Economic Development

State of Chiapas
Blvd Diaz Ordaz No. 11
Tapachula, CH MEXICO
promocion@sde-chiapas.gob.mx
Booth 3513